I. CLAIMS 1, 18, 11, 17, 42, 99, 52 AND 56-57

At paragraph 4 of the Office action, claims 1, 8, 11, 17, 42, 49, 52 and 56-57 are rejected as allegedly defining obvious subject matter over U.S. Pat. No. 4,656,674 to Medwell in view of the Japanese '106 patent and further in view of U.S. Pat. No. 5,630,230 to Fujino et al. In particular, the Office action takes the position that the Medwell reference discloses the basic claimed process of the invention, but does not teach a thermosetting resin-impregnated fabric having ceramic particles mixed therein. The Office action then takes the position that it would have been obvious to one of ordinary skill in the art to provide the thermosetting resin-impregnated fabric having ceramic particles mixed therein of the Japanese '106 reference, and to use such a ceramic fabric in the process of the Medwell reference. The Office action takes the position that the Fujino patent teaches that one of ordinary skill in the art would use the fabric of the Japanese '106 reference in the helmet of the Medwell reference.

However, for the reasons outlined below it is submitted that the Fujino reference does not provide any motivation for the proposed modification, and that therefore the references cannot be combined in the proposed manner Furthermore, for reasons which will be discussed in greater detail below, it is submitted that one of ordinary skill in the art would not be motivated to carry out the proposed modification, and that therefore the references cannot be combined as suggested in the Office action.

A. The Fujino Reference Does Not Provide Any Motivation For The Proposed Modification

In Applicant's previous amendment, Applicant argued that the Office action had not supplied a sufficient motivation for the proposed combination of the Japanese and Medwell references. The present Office action appears to address this issue by citing to the Fujino reference as allegedly supplying motivation for combining the Medwell and Japanese references.

However, for the reasons outlined below, the Fujino reference does not provide any motivation for the proposed modification.

1. The Fujino Reference is Directed to Different Technology That Does Not Correspond to the Technology of the Medwell and Japanese '106 Reference.

The Fujino reference is directed to a cooling cap element which uses evaporation to cool the head of the user. The cooling cap of that reference includes a mesh-like front surface fabric 21, a waterproof back surface fabric 22, and a non-woven fabric 23 disposed between the layers 21, 22 (column 2, lines 41-45). The cap is designed such that the cap can be dipped in water so that the non-woven fabric 23 absorbs the water. The subsequent evaporation of the water out of the non-woven fabric 23 cools the wearer (column 3, line 59 – column 4, line 5). As noted at column 3, lines 19-22, in order to increase the evaporation rate of the water, far-infrared radiation fibers which may include powder ceramics may be added to the non-woven fabric 23.

In contrast, in making its obviousness rejection, the Office action takes the position that it would have been obvious to one of ordinary skill in the art to use the ceramic impregnated fabric of the Japanese '106 reference in the helmet of the Medwell reference to improve the protection from infrared radiation. Neither the Japanese nor the Medwell reference is directed to evaporative cooling, nor the use of ceramics to accelerate evaporative cooling. Thus, the Fujino reference does not provide a motivation for the proposed modification.

Furthermore, the Fujino reference teaches using a ceramic powder *in a non-woven fabric.* However, the Office action proposes taking a ceramic impregnated resin from one reference (the Japanese '106 reference), and using the ceramic impregnated resin in the helmet-making process of another reference (the Medwell reference). Thus, it is not understood how the Fujino reference provides any support for the proposed combination. In particular, the Fujino reference teaches using a ceramic powder in a fabric, which is somewhat analogous to the use of a ceramic powder in a resin as shown in the Japanese reference. However, the Japanese '106 reference

already includes the alleged "teachings" of the Fujino reference; that is, mixing a ceramic powder with another material. In other words, the only alleged teachings provided by the Fujino reference is that a ceramic powder can be added to another material; but this is already shown in the Japanese '106 reference.

The Fujino reference does not teach the use of a resin impregnated with a ceramic power in a helmet making process, and does not disclose, teach or suggest using the ceramic-impregnated woven fabric of that reference in a helmet, or in any other system. Thus, the Fujino reference does not provide any motivation for the proposed combination.

2. The Fujino Reference Does Not Provide Any Motivation for the Proposed Combination

At paragraph four of the Office action, the Office action takes the position that the Fujino reference teaches that a "high polymer mixed with ceramic mixture provides increased protection from infrared radiation" citing to column 1, lines 5-15 and column 3, lines 23-28 of the Fujino reference. The Office action then concludes that it would have been obvious to have provided the resin impregnated fabric of the Japanese '106 reference in the process of the Medwell reference. However, it is not understood how this passage of the Office action, even if true, provides support for the proposed modification. In particular, the Fujino reference discloses that "far-infrared radiation fibers" may be introduced into the non-woven fabric layer 23 of that device. These "far-infrared radiation fibers" may include "synthetic fibers of a high molecular polymer mixed with fine powder ceramics." (column 3, lines 19-25).

In contrast, the system of the Japanese '106 reference is not directed to any "high molecular polymers," but instead includes thermosetting resins impregnated with ceramic powder. It appears that the Office action may be attempting to correlate the "synthetic fibers of a high molecular polymer" of the Fujino reference with a thermosetting resin of the Japanese reference to support the combination. However, the "synthetic fibers of a high molecular polymer" of the Fujino reference are of course different in shape, structure, function, and

Finally, as noted above the motivation for the use of ceramic powder in the Fujino reference is to increase evaporation of water from the non-woven fabric (column 3, line 19). However, such motivation does not apply to the Japanese '106 reference or the Medwell reference. In particular, the impregnated sheeting of the Japanese '106 reference, as well as the thermosetting resin of the Medwell reference are not designed to, and in fact could not, absorb water and then provide effective cooling by evaporation. Thus, one of ordinary skill in the art would have no reason, in light of the cited references, to carry out the proposed modification.

In sum, because: 1) the Fujino reference is directed to combining ceramic powder in a non-woven fabric and is not directed to the use of a combined ceramic power and thermosetting resin in a helmet; and 2) the high molecular polymer synthetic fibers of the Fujino reference do not correspond to the thermosetting resin of the Japanese reference; and 3) the Fujino reference does not disclose the use of ceramic particles to provide protection from infrared radiation, the Fujino reference does not provide any teaching or suggestion for the proposed combination.

B. The Medwell and Japanese '106 References Cannot Be Combined in the Proposed Manner

Even if some motivation to combine could be found in the Fujino reference, when considering all the relevant factors, one of ordinary skill in the art would not be motivated to provide the thermosetting resin/ceramic powder mixture of the Japanese '106 reference in the process of the Medwell reference because the resultant structure would be unstable, susceptible to fracture, and not suitable for use in moist conditions, and thus would not satisfactorily function as a helmet. For example, as noted at page 3, line 17 of the translation of the Japanese '106 reference (a copy of which was submitted in Applicant's previous Amendment), the ceramic fiber cloth of that reference has a flexibility similar to that of a fiber cloth. Also, at page 4, lines 28-29 of the translation, it is noted that the fibers are preferably made of cotton or hemp, and the

flexibility of the resultant fiber cloth is again emphasized. Finally, at page 6, lines 3-8, the tránslation notes:

> The features of said ceramic fiber cloth are that it does not have the "hard" image of conventional ceramics, it has strength without loss of the flexibility characteristic which fiber cloth possesses, it is easy to cut following molding without fall-out of the ceramic powder occurring, and it has an adhesiveness property and a wide range of uses.

Thus, the Japanese '106 reference emphasizes that the ceramic fiber cloth of that reference is not "hard" but is instead flexible and can be easily cut. In fact, the Japanese '106 reference indicates that the flexible sheeting of that reference can be used as bedding and outfits for protection against cold, which are necessarily soft and conforming.

In contrast, protective helmets, such as the helmet of the Medwell reference, must be hard and rigid to provide impact resistance. For example, column 1, lines 6-8 of the Medwell reference acknowledges that composite helmets should be made of a "strong fabric."

Furthermore, as noted in Applicant's previous Amendment, fire fighter or protective helmets are generally required to meet National Fire Protection Association ("NFPA") standards. For example, helmets are tested for NFPA standards of impact resistance by, for example, dropping a steel drop mass having a spherical striking face and specified dimensions against the helmet, and measuring the results. Of course, it is also commonly known and understood that a helmet should protect the wearer from impacts and falling debris.

Thus, the hardness or rigidity of helmets is an important feature, and the Japanese '106 reference discloses that the resultant ceramic fiber cloth of that reference is flexible and not rigid. Thus, it is clear that the ceramic fiber cloth of the Japanese '106 reference would not protect a wearer from impacts, accelerations, or penetrations, and it is submitted that one of ordinary skill in the art would not be motivated to use the ceramic fiber cloth of the Japanese '106 reference in the helmet of the Medwell reference.

Furthermore, the Japanese '106 reference uses a thermosetting urea resin which inherently results in a weak, unstable product. For example, Attachments B, C and D submitted in

Applicant's previous Amendment illustrate the relative weakness and lack of heat and moisture resistance of urea resin products.

Attachments B, C and D note that urea resins are not stable when exposed to moisture, especially in elevated temperatures. Furthermore, the Attachments note that urea resins are particularly used in wood products, such as the manufacture of plywood and particleboard, and other indoor applications which are not subjected to the hazardous conditions to which a helmet is exposed. NFPA testing standards require testing under elevated temperatures, as well as testing of the helmet that has been submerged in water for up to several hours. Thus, the urea resins in the structure of the Japanese reference illustrate the non-acceptability of that compound for use in a helmet.

Finally, at page 4 of the translation of the Japanese '106 reference, the fiber cloth of that reference is referred to as "net-like." The drawings of the Japanese '106 reference also disclose that the fabric is "net-like" with openings therein. Thus, if one were to, for some reason, take the fiber cloth of the Japanese reference and use it in the method of the Medwell reference, the resultant helmet would have gaps or holes formed therein, which would, of course, result in a helmet which provides wholly unsatisfactory protection from falling debris, heat, moisture, etc.

Thus, if one were to use the urea resin/ceramic powder and cloth combination of the Japanese '106 reference in an attempt to make a helmet, the resultant structure would be a helmet that is flexible and has a low impact resistance, is not stable under moisture and at elevated conditions, and that has openings formed therein. The resultant structure would therefore not be useful as a helmet and would not meet NFPA standards. Thus, it is submitted that one of ordinary sill in the art would not be motivated to carry out the proposed modification.

The rejection of independent claims 23 and 36 is also traversed for the same reasons discussed above.

II. CLAIMS 1, 5, 8, 11-13, 15, 17-19, 23, 27, 33-36, 42, 46, 49 AND 52-57

At paragraph 7 of the Office action, claims 1, 5, 8, 11-13, 15, 17-19, 23, 27, 33-36, 42, 46, 49 and 52-57 are rejected as allegedly defining obvious subject matter over U.S. Pat. No. 5,794,271 to Hastings in view of the Japanese '106 reference and further in view of Fujino. The Office action admits that the Hastings reference does not teach a thermosetting resin impregnated fabric having ceramic particles mixed therein. The Office action then takes the position that it would have been obvious to have provided a thermosetting resin impregnated fabric having ceramic particles mixed therein as taught by the Japanese '106 reference.

The Office action indicates that the Fujino reference teaches that a high polymer mixed with ceramic mixture provides increased protection. However, as noted above, it is submitted that the Fujino reference does not provide the teaching advanced in the Office action. Furthermore, one of ordinary skill in the art would not be motivated to use the ceramic fiber of the Japanese '106 reference in a helmet due to the flexibility of the fiber, the inherent weakness of the fiber due to the urea resins, and the general unacceptability of that mesh-like fiber cloth for use in a helmet.

With respect to claims 18, 19, 23 and 36, the Office action indicates that the Hastings reference discloses a first thermosetting resin layer 18, a fiber layer 20 and a second thermosetting layer 22 placed on the fiber layer. However, it is submitted that this disclosure does not teach the subject matter of claims 18, 19, 23 and 36. For example, claim 18 specifies that the method include steps of coating at least a portion of the fiber-based filler with at least a portion of the resin mixture. As noted in claim 17 (from which claim 18 depends), the "resin mixture" is a mixture of coarse ceramic particles mixed into a thermoset resin. In contrast, the epoxies 18, 20 of the Hastings reference do not include ceramic particles mixed therein.

Furthermore, the Office action does not propose impregnating the epoxy resins 18, 20 of the Hastings reference with ceramic particles. Instead, the Office action proposes impregnating the fiber layer 20 of the Fujino reference with ceramic particles. Accordingly, even if the Hastings reference were to be modified in this manner, the invention defined in claims 18, 19, 23 and 36 would not be shown.

III. OTHER CLAIMS

The rejection of claims 2, 20, 24, 37 and 43 is traversed on the basis that the Japanese '320 reference does not disclose chopping ceramic particles. Instead, the Japanese '320 reference discloses grinding, which is of course a different process. The Office action appears to be attempting to equate "grinding" with "chopping." If this is the case, support for such a position is respectfully requested, as it is well known that grinding is a wholly different process than chopping.

The rejection of claims 4, 26 and 45 is traversed. As acknowledged in the Office action, the Japanese '459 reference discloses that the content of the ceramic powder in the slurry is between 5-30% *by volume*. The Office action then appears to equate the disclosed percentage of 5-30% by volume with the approximately 10 to approximately 20% by weight value specified in the claims. However, as is well known, percentage by volume does not translate into percentage by weight. Thus, the cited references clearly do not disclose the subject matter of claims 4, 26 and 45. If the Office action is relying upon knowledge beyond that specified in the Japanese '106 reference, explanation of such outside knowledge is requested so that applicant may have an opportunity to respond and comment thereon.

Even if the Japanese '459 reference discloses the claimed percentage of weight of the ceramic particles, it is submitted that the Office action does not include sufficient motivation for the proposed combination. In particular, the only proposed motivation for the proposed modification appears to be that the Japanese '106 reference "teaches a moldable mixture of thermosetting resin and ceramic particles." However, it is submitted that the mere fact that one reference refers a "moldable mixture of particles" while another reference refers to particles of a particular concentration does not provide a sufficient motivation to combine the references.

Instead, the range specified in claims 4, 26 and 45 represents a specifically selected and engineered design which provides a helmet with sufficient strength while retaining sufficient heat reflectivity. None of these factors are addressed in the Japanese '459 reference which is instead

addressed to the manufacture of a porous ceramic product. Each of claims 4, 26 and 45 have been amended to reflect these characteristics and further distinguish over the cited references.

The rejection of claims 3, 25, 44 and 58 is traversed. The Office action appears to admit that the prior art does not disclose the subject matter of these claims, and instead takes the position that "particle size is a result effective variable." However, it is submitted that this is not the case. In particular, particle size depends upon the objective to be achieved, the thickness of the resin, the composition of the particles and resin, and many other factors.

In fact, this case is analogous to the case cited in the Office action, *In re Antoine* 559 F.2d 618 (CCPA). In that case the Court of Customs and Patent Appeals held that the numerical ratio cited in the claims of that application were not obvious. The court held:

> The PTO and the minority appear to argue that it would always be obvious for one of ordinary skill in the art to try varying every parameter of a system in order to optimize the effectiveness of the system even if there is no evidence in the record that the prior art recognized that particular parameter affected the result. As we have said many times, obvious to try is not the standard of 35 U.S.C. §103.

Id at 620.

Similarly, in this case there is no evidence that the prior art recognizes any criticality of particle size.

The range of sizes of particles specified in claims 3, 25, 44 and 58 is selected such that the particles can be evenly distributed throughout the resin and provide sufficient heat reflectivity without compromising the strength of the resultant helmet. None of the prior art references reflect this consideration or engineering design behind the claimed range of particle sizes. Each of claims 3, 25, 44 and 58 have been amended to specify these features and further distinguish over the cited references. Thus, it is submitted that the subject matter of claims 3, 25, 44 and 58 is not obvious in light of the prior art.

Claim 57 specifies that the steps are carried out until resultant helmet meets the NFPA helmet testing standards. The Office action indicates that the helmet of Medwell meets NFPA

standards. While this statement may or may not be true, it is noted that the helmet of the Medwell reference does not form the basis for the rejections, but instead the helmet of the Medwell reference *as modified by the Japanese '106 reference* forms the basis for the rejection. Thus, even if the helmet of the Medwell reference were to meet NFPA standards (which is not admitted), it is submitted that if the urea resins of the Japanese '106 reference were to be used to manufacture the helmets of the Medwell reference, due to the weakness of urea resins, as well as the lack of resistance to heat and moisture of urea resins, that the modified helmets would not meet NFPA standards.

Furthermore, claim 56 specifies that the curing step include curing the resin mixture until the helmet is generally rigid. The Office action proposes the use of the flexible sheeting of the Japanese reference, which is of course not rigid. Thus, claim 56 clearly defines over the cited references.

With regard to claim 14, the Office action takes the position that the Hetzel reference discloses a fire-fighting helmet having a thickness of 0.08 inches. However, the Hetzel reference refers to an outer liner 10 which is made of leather which may be used in a helmet making process. Accordingly, if the Hetzel reference were for some reason to be combined with the primary references, the resultant structure would be a helmet having a leather outer shell having a thickness of 0.08 inches and which of course would not correspond to the subject matter of claim 14.

With respect to claim 16, the Office action takes the position that the Hastings reference discloses placing a fiber layer onto a first resin layer 18, and then placing a second resin layer 22 on the fiber layer 20. The Office action then takes the position that the fiber layer 20 is positioned in the mold prior to the impregnation. However, it is submitted that the cited passage of the Hastings reference does not provide any support for the proposition advanced therein. In particular, the fiber layer 20 of the Hastings reference could easily be impregnated prior to being placed onto the first resin layer 18. Furthermore, it is submitted that one of ordinary skill in the art would be motivated to impregnate the sub layer 20 prior to placing the fiber layer 20 on the

first resin layer 18 because it is easier to impregnate a sheet when it is laid flat, as opposed to formed into the curved shape of a helmet.

Claims 9 and 50 specify that the thermoset resin is a vinyl esther. The Office action indicates that the Hetzel, Jr. reference teaches that polyester and vinyl ester are equivalent alternatives for molding a protective helmet (citing to column 3, lines 9-14). However, even if the Hetzel, Jr. reference were to include such a teaching, it would not be relevant to the rejection of claims 9 and 50. In particular, the Japanese '106 reference uses urea resins, and if the Japanese '106 reference were to be combined with the Medwell reference, the resultant helmet would of course include urea resins. However, the Office action does not provide any indication that vinyl esters are interchangeable with urea resins. Instead, the Office action cites to the alleged interchangeability of polyester and vinyl esters.

New claims 60-64 specify that the thermosetting resin is not a urea-based resin, to distinguish over the resin of the Japanese '106 reference even if the references were to be combined.

Claims 12, 13, 15 and 53-55 are rejected over the Medwell and Japanese '106 reference in view of the Fujino and Hastings references. The Office action indicates that the Medwell reference discloses providing "additional reinforcement layers," citing to column 2, lines 60-65. However, the cited portion of the Medwell reference merely discloses that a small crown may be located in a small portion of the helmet. This crown 39 can be seen in Fig. 5 of the Medwell reference. The Office action next takes the position that it would have been obvious to use fiber-based sheeting including woven/non-woven fiber glass sheeting as the material of this crown 39.

However, the claims specify that the fiber-based filler is formed into the shape of a protective helmet. In contrast, the small cap or crown 39 is not formed into the shape of a helmet, but is instead formed into a small cap. Thus even if the proposed combination were to be carried out the claimed invention would not result.

The Office action indicates that claim 59 is directed to an invention that is independent or distinct from the invention originally claimed. While it is true that claim 59 is direct to a helmet,

claim 59 is a product-by-process claim. In particular, the steps specified in claim 59 are identical to those of claim 1. Even if the invention of claim 59 is independent and distinct (of which the Office action provides to evidence besides indicating that the subject matter of claim 59 is drawn in an invention classified in class 428, subclass 34.1), as is well known if the search and examination of an application can be made without serious burden, the examiner must examine it on the merits (MPEP §803). It is difficult to imagine a case where there is any less burden that the present one, wherein the specified steps of claim 59 are identical to those of already-examined claim 1.

The Office action notes that applicant has elected to prosecute the invention defined by originally-filed claims 1-37 and 42-55. However, the non-elected claims (claims 38-41) is different in scope from claim 59, and were not clearly written as product-by-process claims. Thus it is submitted that applicant's previous election does not extend to claim 59.

Accordingly, it is submitted that each of independent claims 1, 17, 23, 36, 42 and 59 define over the cited references, and that many of the dependent claims further distinguish over the cited references. Thus, it is submitted that the application is in a condition for allowance and a formal notice thereof is earnestly solicited.

The Commissioner is hereby authorized to charge any additional fees required, including the fee for an extension of time, or to credit any overpayment to Deposit Account 20-0809.

The applicant(s) hereby authorizes the Commissioner under 37 C.F.R. §1.136(a)(3) to treat any paper that is filed in this application which requires an extension of time as incorporating a request for such an extension.

Respectfully submitted,

By_____
Steven J. Elleman
Reg. No. 41,733

MARKED-UP COPY OF AMENDED CLAIMS

3. (Amended) The method of claim 1, wherein the ceramic particles have an average size ranging from approximately 7 microns to approximately 8 microns to improve the heat reflectivity of said helmet while maintaining sufficient strength of said helmet.

4. (Amended) The method of claim 3, wherein the mixing step includes the step of mixing an amount of the ceramic particles into the thermoset resin, wherein the amount of ceramic particles is approximately 10 to approximately 20 percent of the weight of the thermoset resin to improve the heat reflectivity of said helmet while maintaining sufficient strength of said helmet.

25. (Amended) The method of claim 24, wherein the ceramic particles have an average size ranging from approximately 7 microns to approximately 8 microns to improve the heat reflectivity of said helmet while maintaining sufficient strength of said helmet.

26. (Amended) The method of claim 25, wherein the mixing step includes the step of mixing an amount of the ceramic particles into the thermoset resin, wherein the amount of ceramic particles is approximately 10 to approximately 20 percent of the weight of the thermoset resin to improve the heat reflectivity of said helmet while maintaining sufficient strength of said helmet.

44. (Amended) The method of claim 42, wherein the ceramic particles have an average size ranging from approximately 7 microns to approximately 8 microns to improve the heat reflectivity of said helmet while maintaining sufficient strength of said helmet.

45. (Amended) The method of claim 42, wherein the mixing step includes the step of

mixing an amount of the ceramic particles into the thermoset resin, wherein the amount of ceramic particles is approximately 10 to approximately 20 percent of the weight of the thermoset resin to improve the heat reflectivity of said helmet while maintaining sufficient strength of said helmet.

58. (Amended) The method of claim 1 wherein said ceramic particles have an average size of between about 3 microns to about 1000 microns to improve the heat reflectivity of said helmet while maintaining sufficient strength of said helmet.